THE LENGTH, AGE, AND SEX RATIO OF CHUM SALMONIN THE ALASKA PENINSULA, KODIAK ISLAND, AND PRINCE WILLIAM SOUND AREAS OF ALASKA



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IN THE ALASKA PENINSULA, KODIAK ISLAND, AND PRINCE WILLIAM SOUND AREAS OF ALASKA

by

Fredrik V. Thorsteinson, Wallace H. Noerenberg, and Howard D. Smith

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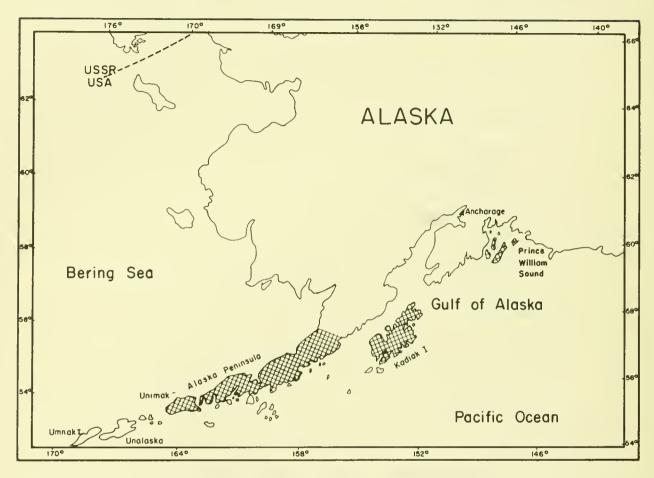


Figure 1.--Western Alaska. Data on chum salmon were collected in three cross-hatched areas from 1948 through 1958.

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ABSTRACT

Data on length, age, and sex ratio of chum salmon from the Alaska Peninsula area from 1951 through 1957, the Kodiak Island area from 1948 through 1951 and 1955 through 1957, and the Prince William Sound area from 1952 through 1958 show that age and length composition in these areas varied in a similar manner. Lengths of fish in the 3-, 4-, and 5-year age classes overlapped to such an extent that length was not a useful guide to age. The average age composition for the combined samples was about 10 percent 3-year-olds, 75 percent 4-year-olds, and 15 percent 5-year-olds. Mean age decreased as the season advanced. The percentage of males decreased slightly as the runs progressed.

INTRODUCTION

Chum salmon (Oncorhynchus keta) rank third in abundance and value in Alaska's salmon fisheries. Despite their importance, little research has been done on this species.

The Fisheries Research Institute (FRI), College of Fisheries, University of Washington, collected data on the length, age, and sex ratio of chum salmon incidental to research on other species of salmon in the Alaska Peninsula, Kodiak Island, and Prince William Sound areas between 1948 and 1958 (fig. 1). No planned program for sampling chum salmon was organized, but data were taken when chum salmon were available and when the time

required for processing them did not conflict with other studies. Because of time limitations, the material was not analyzed at the end of each year, and changes in sampling techniques that might be expected to follow such analyses were not made. As a result, the data presented here are not complete or continuous, and no comprehensive analysis of the chum salmon runs to the three areas for the years when sampling was conducted is made. In spite of its limitations, this material has importance because it is the only biological information concerning past chum salmon runs in the three areas.

The objectives of this paper are to (1) present basic material collected during the several years; (2) draw tentative conclusions as to intraseasonal and interarea variability in length, age, and sex ratio; and (3) recommend methods of sampling for future studies.

Note.--Thorsteinson presently with Bureau of Commercial Fisheries, Juneau, Alaska; Noerenberg with Alaska Department of Fish and Game, Cordova, Alaska; and Smith with Fisheries Research Board of Canada, Nanaimo, B.C.

The data discussed are from the commercial catch and the spawning grounds in the areas and years as follows:

- 1. Alaska Peninsula commercial catch, 1951-57.
- 2. Kodiak Island commercial catch, 1948-51 and 1955-57.
- 3. Prince William Sound commercial catch, 1952-53 and 1956-58, and spawning grounds, 1952-57.

DATA COLLECTION

The commercial catch samples were obtained chiefly at salmon canneries, but a small number were taken on the Prince William Sound fishing grounds during tagging operations. The spawning ground samples were collected during stream surveys and tag recovery programs in Prince William Sound.

Fish sampled at the canneries were caught by traps, purse and beach seines, and gill nets. The gear type was recorded, since certain types, particularly gill nets, were probably selective for size of fish and for sex.

The length from mideye to fork of tail was determined in millimeters by one of two instruments devised by the Institute's staff for measuring salmon in the field. These are described by Duncan¹ and Thompson.² Both machines give a straight line measurement and avoid much of the bias inherent in simple tape measurements.

For salmon taken on the spawning grounds the mideye-fork measurement had to be replaced by a mideye to hypural plate measurement because of eroded caudal fins on many of the fish. All measurements were converted to mideye-fork length by the formula

Y = 1.1048 X - 1.1052

where Y is the mideye-fork measurement and X the hypural plate measurement. The

¹Duncan, Rea E. 1956. Two measures of the length of red salmon, *Oncorhynchus nerka* (Walbaum), their relation and application in the study of the catch and escapement in Bristol Bay, Alaska, M.S. Thesis, University of Washington, Seattle, 92 p.

²Thompson, William F. Report in preparation at Fisheries Research Institute.

formula was calculated from paired measurements obtained from 228 chum salmon taken in traps on the Alaska Peninsula from June 20 to July 30, 1951.

Scales for age determination were taken from at least 20 percent of the fish measured in each sample. In small samples, proportionately more scales were taken.

Sex ratios were obtained from counts of fish as they passed along the cannery conveyor belts, or from piles of fish in the cannery bins. The number of fish used in determining sex ratios was usually more than the number measured for length. Fish in small deliveries were frequently canned before a large sample could be obtained.

DATA ANALYSIS

Data on length, age, and sex ratio were arranged by date and locality of catch.

Length measurements, recorded to the nearest millimeter in the field, were grouped in 1-cm. intervals. Some workers began their groups with even centimeters, e.g., 570 mm.; others began them 1 mm. larger, e.g., 571 mm. Since the corresponding centimeter groups would be 570-579 and 571-580, the midpoints 574.5 and 575 fell one-half millimeter apart. This minor discrepancy was not considered in analyzing the data.

To determine age, plastic impressions suitable for microprojection were made from scales that were mounted sculptured side out on gummed cards. The procedure is outlined by Koo (in press). Most of the scales were read by Thorsteinson and Noerenberg, but a few were read by Smith and other members of the FRI staff. Agreement in scale interpretation was tested by an independent reading of a set of 200 scales by each author. Eight scales were regenerated and judged unreadable by each reader. Some disagreement existed in interpreting the scales: 15 (7.5 percent) were read as different ages by one or more readers. In view of the difficulty in establishing the position of chum salmon scale annuli (Henry, 1953), this disagreement may not be excessive. It does suggest a need for standardizing methods of interpreting chum salmon scales and investigating patterns of scales from fish of known ages.

Sex ratios were calculated as percentages.

The data, set up in standardized format, are arranged to provide the original material for analysis and reference in this report as appendixes A, B, and C. They are organized as follows:

- 1. A chronological tabulation of scale samples, giving each a number for convenient reference and showing the date, location of sample, gear used, and number of measurements and scale samples obtained (appendix tables A-1, B-1, C-1, C-2).
- 2. A map of each area showing localities where samples were taken (appendix figures A-1, B-1, C-1, C-2).
- 3. A frequency tabulation to the nearest half centimeter midpoint for all lengths having corresponding ages by age and sex. All fish less than 500 mm. and more than 749 mm. are grouped, because they make up insignificant numbers of the total (appendix tables A-2, B-2, C-3, C-4).
- 4. The sex ratio of all samples (appendix tables A-3, B-3, C-5, C-6).

In the Prince William Sound area, streams where spawning ground samples were taken are designated according to the time of their runs--early, middle, or late. Noerenberg classifies Prince William Sound streams as follows: early runs peak between July 15 and August 5, middle runs between August 6 and 20, and late runs between August 21 and September 10.3

Since sampling was not complete or continuous for any one year or series of years, the general relationships of length with age were studied by combining all length measurements by age classes for each area irrespective

of the year, time of season, or source of the sample. In using the combined yearly data, two points were considered: types of gear used and the treatment of the spawning ground samples from Prince William Sound.

Gill nets are usually considered to be selective for size and sex. In our samples from gill nets, ages and lengths were distributed within about the same limits as in samples from traps and seines, and separating the data by type of gear did not appear justified. Usable data from the Prince William Sound commercial catch and spawning grounds were obtained in only 3 years. The mean lengths of 4-year-olds (table 1), the dominant age class. were similar: and no directional bias was evident between catch and spawning ground samples. Because of the similarity in lengths. all of the samples from Prince William Sound were used for comparisons with other areas. even though in some years samples were exclusively from the commercial catch and in some, exclusively from the spawning grounds.

In contrast to the similarity in length, the age compositions of samples from the catch and spawning grounds were not sufficiently alike to permit grouping. In table 2 age composition samples for 1952, 1953, and 1956 are combined by sex. The percentage of 3-year-olds in the catch is about three times that on the spawning grounds, and the percentage of 5-year-olds in the catch about half that on the spawning grounds. This approximate relationship prevailed in all 3 years having comparable data (appendix tables C-3 and C-4).

Changes in length composition were studied through the mean lengths of 4-year-old fish, grouped according to sex. Only 4-year-olds, the dominant age class, were studied, since changes in mean lengths of 3- and 5-year-olds varied in the same way as 4-year-olds. Changes in age composition were studied as numbers and percentages of fish occurring in the three age groups. Sex ratios were determined from entire samples.

³Noerenberg, W. H. 1954. Prince William Sound spawning ground survey, 1954. University of Washington, Fisheries Research Institute, Circular No. 69, 19 p. [Duplicated.]

Table 1.--Mean lengths of 4-year-old chum salmon from Prince William Sound commercial catch and spawning ground samples, 1952, 1953, and 1956

]	Males		Females				
Year	Comn	nercial	Spaw	vning	Commer	cial	Spaw	ning	
Icai	cat	ch	gro	unds	catch		gro	unds	
	Number	r Length	Number	Length	Number	Length	Number	Length	
		Mm.		Mm.		Mm.		Mm.	
1952	158	652	128	632	212	637	152	629	
1953	351	622	683	634	424	620	572	617	
1956	424	605	393	601	433	598	471	598	
Mean		626		618		618		615	

Table 2.--Age composition of 3-, 4-, and 5-year-old chum salmon in Prince William Sound catch and spawning ground samples, 1952, 1953, and 1956 combined

Sex and source			Age in	years		
Sex and source	3		4	4	5	
	Number	Percent	Number	Percent	Number	Percent
Males						
Commercial catch	88	26.0	227	67.0	24	7.0
Spawning grounds	43	8.7	367	74.3	84	17.0
Females						
Commercial catch	39	11.5	275	81.4	24	7.1
Spawning grounds	11	2.4	377	83.4	64	14.2

RESULTS AND DISCUSSION

More than 10,000 age-length determinations were made for chum salmon from the three areas. Age class 6 has not been considered in this paper because it occurs infrequently. The greatest number found in our samples amounted to 0.05 percent in the Kodiak Island area.

The most striking feature of the age-length relationship was the great overlap in the length distributions of fish in three age classes (fig. 2). Three- and five-year-old chum salmon overlapped through almost half their ranges, and 4-year-olds overlapped almost the entire range of the other two age groups. It is clear from figure 2 that length cannot be used as a reliable guide to age, or vice versa, in Alaska chum salmon.

Since there was no dependable relationship between length and age in any area, they are treated separately in the discussions of variability within seasons and between areas.

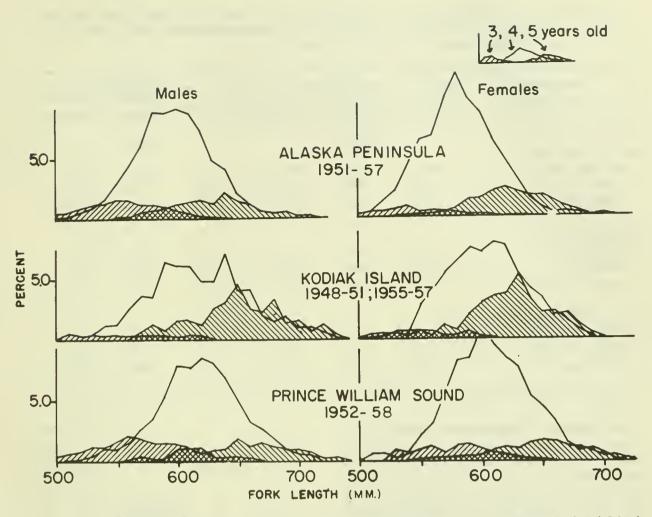


Figure 2.--Age-length relationships of 3-, 4-, and 5-year-old chum salmon in the Alaska Peninsula, Kodiak Island, and Prince William Sound areas of Alaska.

Intraseasonal Variation

To compare the runs of the Alaska Peninsula, Kodiak Island, and Prince William Sound areas intraseasonally, fishing seasons were divided arbitrarily into three periods—before July 1, between July 1 and 15, and after July 15.

In the division by time, we assumed that fish caught before July 1 on the Alaska Peninsula (except those taken at Chignik) were bound for areas other than the Peninsula. Chum salmon are captured simultaneously with pink and red salmon in the Peninsula fishery during June. Tagging experiments (Gilbert and Rich, 1927; Thorsteinson, 1959)

showed that red and pink salmon taken at that time of the season were bound for other areas. Since it is possible that early chum salmon are also bound for other areas, we felt that the data for the three periods should be kept separate.

Length.--The mean lengths and standard deviations of combined yearly samples of age class 4 from each area are shown by the three time periods in table 3. To avoid bias in years when runs of exceptionally large or exceptionally small fish were not sampled in all time periods, the data are combined for only those years when three periods were represented in the Alaska Peninsula area and two in the Kodiak Island and Prince William Sound areas.

Table 3.--Variability in size of 4-year-old chum salmon in three time periods in catch, Alaska Peninsula, 1951, 1953-57; Kodiak Island, 1949, 1955-57; Prince William Sound, 1953, 1956, 1958

<u> </u>		Males		į	Females	6
Area and	Number	Average	Standard	Number	Average	Standard
time period	Number	length	deviation	Number	length	deviation
		Mm.		9	Mm.	
Alaska Peninsula	-					
Before July 1	665	600	29.0	677	570	25.8
July 1-15	676	605	32.8	661	589	27.5
After July 15	568	598	32.9	613	587	26.3
				ŀ		
Kodiak Island						
Before July 1						~ ~ ~
July 1-15	144	616	39.0	133	605	28.9
After July 15	227	635	38.7	234	611	33.7
Prince William Sound						
Before July 1						
July 1-15	84	618	37.0	89	598	32.5
After July 15	169	617	30.6	208	608	29.3

Mean lengths of chum salmon of both sexes in age class 4 were slightly greater in the third period in the Kodiak Island area. Means were similar in all three periods on the Peninsula--for males the range was only 7 mm. The means showed no appreciable change with time of sampling in Prince William Sound.

Age composition, -- Age composition of the combined samples for all of the years is given by the three time periods in table 4 and shown graphically in figure 3. The data are so few in the first period for the Kodiak Island and Prince William Sound areas that only males from the Kodiak Island area are plotted in the figure. The age composition shifted with time: 3-year-old fish increased and 5-year-old fish decreased in relative abundance as the season progressed. Four-year-olds were dominant throughout the season and made up about three-fourths of the total run. This trend toward younger fish as the season advanced is not an artifact of combining the data. Catch data from the East Anchor Cove-Ikatan Bay and Izembek Bay areas of the Alaska Peninsula show the same sequence of shift in ages (table 5).

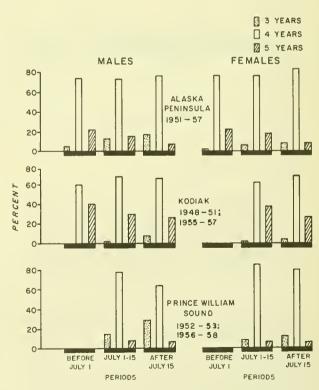


Figure 3.--Percentage 3-, 4-, and 5-year-old chum salmon in three time periods in the catch in Alaska Peninsula, Kodiak Island, and Prince William Sound areas.

Table 4.--Number and Percentage of 3-,4-, and 5-year-old chum salmon in three time periods in catch, Alaska Peninsula, 1951-57; Kodiak Island, 1948-51, 1955-57; Prince William Sound, 1952-53, 1956-58

Area, sex, and				in years		
time period		3	4	1	5	
	Number	Percent	Number	Percent	Number	Percent
Alaska Peninsula					111111111111111111111111111111111111111	Terecit
Males						
Before July 1	62	5.3	874	74.2	242	20.5
July 1-15	116	12.5	676	72.9	135	14.6
After July 15	140	17.2	618	75.8	57	7.0
Females						
Before July 1	15	1.3	857	77.0	242	21.7
July 1-15	49	5.6	662	75.8	162	18.6
After July 15	58	7.0	698	84.9	67	8.1
Kodiak Island						
Males						
Before July 1	0	0	6	60.0	4	40.0
July 1-15	3	1.4	144	68.3	64	30.3
After July 15	54	7.9	455	66.5	175	25.6
Females						
Before July 1	0	0	5	100.0	0	0
July 1-15	1	0.5	133	62.7	78	36.8
After July 15	24	3.8	436	69.1	171	27.1
Prince William Sound						
Males	ne programa					
Before July 1						
July 1-15	17	15.4	84	76.4	9	8.2
After July 15	93	28.8	206	63.8	24	7.4
Females			Printer of the Control of the Contro			
Before July 1	0	0	4	100.0	0	0
July 1-15	9	8.6	89	84.7	7	6.7
After July 15	40	12.8	251	80.2	22	7.0

This same situation is paralleled on the Prince William Sound spawning grounds. Helle (1960) 4 compared early and late spawning runs and found that in both, fish in age class 5 were most abundant in the initial stages of the runs, and fish in age class 3 became more abundant as the season of the runs advanced.

Sex ratio.--The sex ratio is shown by time periods in table 6. It was in favor of males early in the season and decreased slightly as the season progressed. The situation was the same in all three areas, although data taken before July 1 in the Kodiak Island and Prince William Sound areas are too few to be dependable.

Interarea Variability

Length.--In figure 4 the mean lengths of age classes 3, 4, and 5 are plotted by area to permit an evaluation of length with age. The

⁴Helle, John Harold. 1960. Characteristics and structure of early and late spawning runs of chum salmon, Oncorhynchus keta (Walbaum), in streams of Prince William Sound, Alaska, M.S. Thesis, University of Idaho, 53 p.

Table 5.--Number and percentage of 3-, 4-, and 5-year-old chum salmon in three time periods in catch, East Anchor Cove-Ikatan Bay, 1951, 1952-57; Izembek Bay, 1955-57

Area, sex, and			Age i	n years		
time period		3	4		5	5
East Anchor Cove-Ikatan	Number	Percent	Number	Percent	Number	Percent
Bay						
Males						
Before July 1	32	8.3	278	72.4	74	19.3
July 1-15	88	24.0	233	63.5	_	12.5
After July 15	15	26.8	34	60.7	7	12.5
Females						
Before July 1	7	2.1	282	83.2	50	14.7
July 1-15	35	11.4	216	70.4	56	18.2
After July 15	8	15.4	42	80.8	2	3.8
Izembek Bay						
Males						
Before July 1	1	1.8	53	94.6	2	3.6
July 1-15	10	3.1	278	85.8	36	11.1
After July 15	31	8.4	315	84.9	25	6.7
Females						
Before July 1	0	0	48	88.9	6	11.1
July 1-15	8	2.4	279	85.4	40	12.2
After July 15	10	2.6	343	90.3	27	7.1
After July 15	10	2.6	343	90.3	27	7.

Table 6.--Sex ratio of chum salmon in three time periods, Alaska Peninsula, 1951-57; Kodiak Island, 1948-51, 1955-57; Prince William Sound, 1952-58

Area and time period	Males		Fem	nales
	Number	Percent	Number	Percent
Alaska Peninsula				
Before July 1	1,634	53.0	1,446	47.0
July 1-15	2,392	53.0	2,081	47.0
After July 15	2,446	52.0	2,255	48.0
			full	
Kodiak Island				
Before July 1	70	70.0	30	30.0
July 1-15	400	52.0	373	48.0
After July 15	1,415	49.0	1,462	51.0
Prince William Sound				
Before July 1	5		4	
July 1-15	416	49.0	427	51.0
After July 15	025ء 1	45.0	1,252	55.0

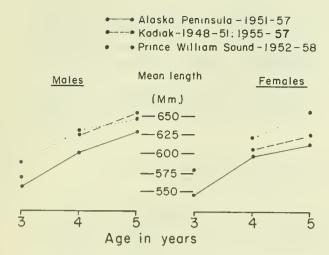


Figure 4.--Mean lengths of chum salmon in Alaska Peninsula, Kodiak Island, and Prince William Sound areas by age and sex (points are unweighted means).

points are unweighted means calculated from table 7. The figure shows that despite the inconsistency of the sources of the yearly data, the basic relationships of size with age prevailed in all areas. Age class 3 females from the Kodiak Island area were too few to use. Mean lengths increased from west to east: Alaska Peninsula chum salmon were smallest and Prince William Sound chum salmon largest.

In table 7 the numbers of fish in each age class, average lengths, and standard deviations for each sample are shown for the three areas for the years 1948-58. Age classes containing fewer than 10 fish were not used in the calculations.

Lengths in each age class varied little from one year to the next, the greatest variation occurring in males in age class 4 from the Kodiak Island area; in 1955 males were 70 mm. (almost 3 inches) larger than those in 1948. In any year fish of the same age class tended to be relatively the same length. Even though fish of different ages were exposed to different growing conditions during their life in the ocean, they all tended to be relatively large or relatively small at maturity. For example, in 1952 average lengths were greater than the long-term mean, and in 1956, except for females in age class 4 in the Kodiak Island area, they were smaller.

Age composition.—The age composition of samples combined by years for each area is shown in table 8. All age data are grouped to give an average value for age composition of chum salmon in the general region under consideration. Age class structure of chum salmon of the central and western part of Alaska averaged about 10 percent 3-year-olds, 75 percent 4-year-olds, and 15 percent 5-year-olds. The percentages were fairly consistent from year to year.

Age composition for the Kodiak Island area varied from that for the Alaska Peninsula and Prince William Sound areas. In the Kodiak Island area about 27 percent of the fish in the samples were in age class 5, which was about twice the percentage of age class 5 fish in the other two areas. Fish in age class 3, on the other hand, formed a greater proportion of the Prince William Sound and Alaska Peninsula runs than they did of the Kodiak Island area When 'year-to-year changes were inspected with regard to the long-term mean age composition, it appeared that all three areas tended to vary in the same direction at the same time. For instance, in the Alaska Peninsula and Prince William Sound areas, low percentages of 4-year-olds were found in 1952. In 1956 in all three areas, high percentages of 4-year-olds were taken.

Sex ratio.--Sex ratio by area and by year are given in appendix tables A-3, B-3, C-5, and C-6. Differences in the percentage of males from place to place were negligible.

RECOMMENDATIONS

During the analysis we found that because of the inconsistency of collecting data by locality of sampling, season of the fishery, or stage of the spawning migrations, only general conclusions could be drawn about chum salmon in the various areas. More precise estimates of parameters of length, age composition, and sex ratio, as well as other biological statistics, are needed. With reference to the characters measured during this study, we recommend the following for future work:

1. Since the age composition in the fishery and the spawning migration does change during the season, samples should be taken from both at regular and frequent intervals.

- 2. If a program is to continue over a period of more than I year, sampling should be done in the same localities and the same time periods each year.
- 3. Larger scale samples than are customarily taken for determining age in other species of salmon are required.
- 4. To eliminate the task of converting length measurements, a single measurement, such as mideye to hypural plate, should be taken in both fresh- and salt-water samples.
- 5. In view of the difficulty in interpreting age from chum salmon scales, the problem should be reviewed and methods standardized.

Table 7.--Length statistics of chum salmon from Alaska Peninsula, Kodiak Island, and Prince William Sound areas

age of fish (years) Number length Average length Standard deviation Number length Average length Standard deviation Alaska Peninsula 1951 3 14 550 29.6 7 34 44 589 35.2 43 582 34.3 34.3 35.8 20 592 29.2 <	Area, year, and		Males			Females	
Number length deviation Number length deviation				Standard			Standard
Alaska Peninsula 1951 3	9	Number	_		Number		
Alaska Peninsula 1951 3	()						
1951 3 4 44 589 35.2 43 582 34.3 5 16 633 35.8 20 592 29.2 1952 3 56 564 37.6 20 557 26.5 4 50 612 39.3 85 599 30.1 5 8 11 625 28.4 1953 3 55 581 35.6 48 581 34.8 4 184 607 34.6 192 581 31.7 5 34 631 35.9 38 605 35.1 1954 3 183 567 28.7 45 550 24.6 4 840 611 32.7 845 597 30.7 5 225 640 36.4 265 627 27.4 1955 3 3 30 536 24.7 10 530 24.8 4 224 604 30.1 238 582 27.3 5 28 630 35.8 31 609 23.0 1956 3 41 546 27.7 19 540 22.0 4 716 592 26.8 737 578 24.2 5 35 624 23.6 31 603 24.9 1957 3 28 558 25.1 14 533 21.2 24 25 605 32.8 213 584 27.0 5 Unweighted average length (all years) 3 4 602.9 548.5 548.5 548.5 548.5 548.5 548.5 548.5 548.5 548.5 548.5	Alaska Peninsula		101111.			441111	
3 14 550 29.6 7 4 44 589 35.2 43 582 34.3 5 16 633 35.8 20 592 29.2 1952 3 56 564 37.6 20 557 26.5 4 50 612 39.3 85 599 30.1 5 8 11 625 28.4 1953 3 55 581 35.6 48 581 34.8 4 184 607 34.6 192 581 31.7 5 34 631 35.9 38 605 35.1 1954 3 183 567 28.7 45 550 24.6 4 840 611 32.7 845 597 30.7 5 225 640 36.4 265 627 27.4 1955 3 30 536 24.7 10 530 24.8 4 224 604 30.1 238 582 27.3 5 28 630 35.8 31 609 23.0 <t< td=""><td>,</td><td>1</td><td></td><td></td><td></td><td></td><td></td></t<>	,	1					
4		14	550	29.6	7		
1952 3 4 5 6 633 35.8 20 592 29.2 1952 3 4 50 612 39.3 85 599 30.1 5 8 11 625 28.4 1953 3 55 581 35.6 48 581 34.8 4 184 607 34.6 192 581 31.7 5 34 631 35.9 38 605 35.1 1954 3 4 840 611 32.7 845 597 30.7 5 225 640 36.4 265 627 27.4 1955 3 3 3 53 53 53 624.7 10 530 24.8 4 224 604 30.1 238 582 27.3 5 28 630 35.8 31 609 23.0 1956 3 41 546 27.7 19 540 22.0 4 716 592 26.8 737 578 24.2 5 35 624 23.6 31 603 24.9 1957 3 4 205 605 32.8 21.2 25 500.7 Unweighted average length (all years) 3 4 557.4 602.9		1				582	34.3
1952 3							
3		10	033	33.0		-,-	
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3 41 546 27.7 19 540 22.0 4 716 592 26.8 737 578 24.2 5 35 624 23.6 31 603 24.9 1957 3 28 558 25.1 14 533 21.2 205 605 32.8 213 584 27.0 5 106 624 28.7 101 607 30.7 Unweighted average length (all years) 3 4 602.9 5586.0	5	28	630	35.8	31	609	23.0
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5 35 624 23.6 31 603 24.9 1957 3 28 558 25.1 14 533 21.2 205 605 32.8 213 584 27.0 106 624 28.7 101 607 30.7 101 101 102	4	716	592		3		
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(00.7						586.0	
	5		630.3			609.7	

Table 7.--Length statistics of chum salmon from Alaska Peninsula, Kodiak Island, and Prince William Sound areas--continued

Area, year, and		Males			Females	
age of fish	Number	Average	Standard	Number	Average	Standard
(years)		length	deviation		length	deviation
		Mm.			Mm.	
Kodiak Island						
1948						
3	14	571	38.5	8		
4	63	596	32.1	69	594	29.0
5	36	647	37.0	42	622	36.4
1949	en e					
3	2			3		
4	99	603	31.2	110	588	30.4
5	62	631	36.5	40	609	27.0
1950						
3	1	c		2		
4	38	617	35.1	37	598	28.6
5	18	652	31.0	17	628	14.5
1951						
3	1			1		
4	11	651	36.8	4		
5	7			11	615	26.9
1955						
3	4			0		
4	81	666	35.4	86	634	26.1
5	61	681	28.4	82	648	24.9
1956						
3	1			1		
4	33	612	30.6	33	610	24.0
_5	4			3		
1957						
3	6			0		
4	120	630	32.9	101	614	25.3
5	24	663	29.4	32	623	28.0
Unweighted aver-						
age length (all			1			
years)						
3		571				
$\dot{4}$		625.0			606.3	
5		654.8			624.2	

Table 7.--Length statistics of chum salmon from Alaska Peninsula, Kodiak Island, and Prince William Sound areas--continued

Area, year, and	1	Males			Females	
age of fish	Number	Average	Standard	Number	Average	Standard
(years)		length	deviation		length	deviation
		Mm.			Mm.	
Prince William		101111.			IVIIII.	
Sound						
1952						
3	27	606	20.9	17	593	16.4
4	47	644	27.3	41	634	28.0
5	22	681	23.4	32	669	27.9
	22	081	23.4	34	009	21.7
1953	50	565	32.1	10	581	23.7
3	50	565		19		
4	300	634	32.6	325	618	28.4
5	74	653	33.8	50	651	27.5
1954			20. 5			21.2
3	29	569	29.5	15	575	21.2
4	20	647	39.2	25	625	40.4
5	7			3		
1955						
3	4			2		
4	22	638	36.1	23	629	22.3
5	2			2		
1956						
3	53	564	31.6	14	573	25.5
4	245	601	29.9	288	598	29.9
5	11	633	42.8	5		
1957						
3	12	623	40.6	3		
4	77	625	30.3	80	623	42.3
5	20	628	31.8	24	647	33.4
1958	1					
3	14	597	26.6	8		
4	54	629	30.4	53	612	30.7
5	7			4		
Unweighted aver-						
age length (all						
years)				4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		
3		587.3		4 1 2	580.5	
4		631.1			619.9	
5		648.8		(655.7	

Table 8.--Age composition of chum salmon from Alaska Peninsula, Kodiak Island, and Prince William Sound areas

Area, year, and age of fish (years)	Mal	les	Fen	nales
Of fish (years)	Number	Percent	Number	Percent
Alaska Peninsula	1141111111111			
1951				
3	14	18.9	7	10.0
4	44	59.5	43	61.4
5	16	21.6	20	28.6
Total	74		70	
1952				
3	58	50.0	20	17.2
4	50	43.1	85	73.3
5	8	6.9	11	9.5
Total	116		116	
1953				
3	55	20.1	50	17.8
4	184	67.4	193	68.7
5	34	12.5	38	13.5
Total	273		281	
1954				
3	183	14.7	45	3.9
4	840	67.3	845	73.2
5	225	18.0	265	22.9
Total	1,248		1,155	
1955				
3	30	10.6	10	3.6
4	224	79.4	238	85.3
5	28	9.9	31	11.1
Total	282		279	
1956				
3	41	5.2	19	2.5
4	716	90.4	737	93.6
5	35	4.4	31	3.9
Total	792		787	
1957				
3	28	8.3	14	4.3
4	205	60.5	213	64.9
5	106	31.2	101	30.8
Total	339		328	
All years				
3	409	13.1	165	5.5
4	2,263	72.4	2,354	78.0
5	452	14.5	497	16.5
Total	3,124		3,016	

Table 8.--Age composition of chum salmon from Alaska Peninsula, Kodiak Island, and Prince William Sound areas--continued

Area, year, and age of fish (years)	Ma.	les	Fen	nales
	Number	Percent	Number	Percent
Kodiak Island	* 10-9-10-10-10-10-10-10-10-10-10-10-10-10-10-		Real Condition Processing	***************************************
1948				
3	15	13.1	8	6.7
4	63	55.3	69	58.0
5	36	31.6	42	35.3
Total	114		119	
1949				
3	4	2.4	4	2.6
4	99	60.0	110	71.4
5	62	37.6	40	26.0
Total	165		154	
1950				
3	1	1.7	2	3.6
4	38	66.7	37	66.1
5	18	31.6	17	30.3
Total	57		56	
1951				
3	1	5.3	1	6.3
4	11	57.9	4	25.0
5	7	36.8	11	68.7
Total	19		16	
1955				
3	4	2.7	0	0
4	81	55.5	86	51.2
5	61	41.8	82	48.8
Total	146		168	10,0
1956				
3	1	2.6	1	2.7
4	33	86.8	33	89.2
5	4	10.5	3	8.1
Total	38	10.5	37	0.1
1957	30		31	
3	31	8.5	9	3.0
4	280	76.5	235	78.9
5	55	15.0	54	18.1
Total	366	15.0	298	10.1
All years				
3	57	6.3	25	2.9
4	605	66.9	574	67.7
5				
Total	243 905	26.8	249 848	29.4

Table 8.--Age composition of chum salmon from Alaska Peninsula, Kodiak Island, and Prince William Sound areas--continued

Area, year, and age	Mal	es	Fem	ales	
of fish (years)					
	Number	Percent	Number	Percent	
Prince William					
Sound					
1952	27	27.8	17	18.9	
3	47	48.5	41	45.6	
4	23	23.7	32	35.5	
5	97	23.7	90		
Total	91				
1953	50	11.7	19	4.9	
3	302	70.9	324	82.4	
4	74	17.4	50	12.7	
5	426	11.1	393		
Total	420				=
1954	30	52.6	15	34.9	
3	20	35.1	25	58.1	
4	7	12.3	3	7.0	
5	57	12.5	43		
Total	31				_
1955	4	14.3	2	7.4	
3	22	78.6	23	85.2	
4	2	7.1	2	7.4	
5	28	1.7	27		
Total	20			According to the second	
1956	54	17.4	14	4.6	
3	245	79.1	287	93.5	
4	11	3.5	; 6	1.9	
5	310		307		
Total	310	The second secon	And the second s	and the same and proper street of the same street o	
1957	12	10.8	. 3	2.8	
3	77	69.4	80	74.8	
4	22	19.8	24	22.4	
5	111	17.0	107		
Total	111				and the same
1958	14	18.4	8	12.3	
3	55	72.4	53	81.5	
4	7	9.2	4	6.2	
5	76	7	65		
Total	10				
All years	191	17.2	78	7.6	
3	768	69.5	833	80.7	
4 5	146	13.2	121	11.7	
	1.105		1,032		
Total	1,105				
All areas and					
years	657	12.8	268	5.5	
3	3,636	70.8	3,761	76.8	
4	841	16.4	867	17.7	
5 Total	5,134	10,1	4,896		
Total	1 3,132				

SUMMARY

Data on length, age, and sex ratio of chum salmon were collected between 1948 and 1958 in the Alaska Peninsula, Kodiak Island, and Prince William Sound areas of Alaska. The data are not complete or continuous, as no formal program for sampling was organized. Material was collected according to the time available to biologists working in the areas and the availability of the fish. The data are the only biological information (except for catch statistics) for past runs of this species in the three areas, and as such represent an important source of historical and reference material. They are therefore included as an appendix to this report.

Analyses were performed by grouping the data by years, by area, and by time periods within years. The data permit only general statements concerning the chum salmon runs to three areas, but do provide a measure of the intraseasonal and interarea variability in length, age, and sex ratio.

The analyses are summarized as follows:

- 1. Length distributions of chum salmon in the three principal age classes overlapped considerably. Three- and five-year-old length distributions overlapped by 50 percent, and age class 4 overlapped almost the entire range of the adjoining two age classes. Consequently, length is not a useful guide to age in these areas, and vice versa.
- 2. Little difference was found in the mean size of chum salmon of the same age class either among the three areas or during the spawning season. Prince William Sound fish were largest. Mean lengths increased from west to east.
- 3. Age class structure of the chum salmon runs of the central and western regions of Alaska averaged about 10 percent 3-year-olds, 75 percent 4-year-olds, and 15 percent 5-year-olds.
- 4. Age composition is similar in the Alaska Peninsula and Prince William Soundareas, but somewhat different in the Kodiak Island area.

Kodiak Island has significantly more 5-year-old fish and fewer 3-year-old fish than the other two areas.

- 5. Age composition of the runs changes within seasons in all three areas. As the season progresses, 3-year-olds increase and 5-year-olds decrease. The percentage of fish in age class 4 remains fairly constant throughout the season.
- 6. Sex ratios do not deviate markedly from 50:50, either by area or in time. The trend is toward fewer males as the season progresses.

ACKNOWLEDGMENTS

Several members of the Fisheries Research Institute staff contributed to the work reported here. The principal contributors were John F. Roos, who conducted some of the sampling and read some of the scales from the Alaska Peninsula area, and Charles E. Walker, who collected data and read scales from the Kodiak Island area.

Salmon packers who assisted in the three areas were:

Alaska Peninsula area:
P. E. Harris Co., Inc.
Pacific American Fisheries, Inc.
Alaska Pacific Salmon Co.
Alaska Packers Association
Chignik Fisheries Co.

Kodiak Island area:

Alaska Packers Association
San Juan Fishing and Packing Co.
Kodiak Fisheries Co.
Pacific American Fisheries, Inc.
Parks Canning Co.
Libby, McNeill and Libby
Washington Fish and Oyster Co.
West Point Canning Co.
Halferty Canneries, Inc.
King Crab, Inc.

Prince William Sound area:
Halferty Canneries, Inc.
New England Fish Co.
San Juan Fishing and Packing Co.
Copper River Co-op, Inc.

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APPENDIX

A. Biological Statistics for Chum Salmon, Alaska Peninsula area, 1951-57

Table A-1. -- Particulars of measurements and scale samples of chum salmon (BS = Beach Seine, PS = Purse Seine, T = Trap, GN = Gill Net) taken in Alaska Peninsula commercial catch, 1951-57

			Gear	Number	of measurement	ements	Number	of scales	es
Date		Sample number and location	nsed	Male	Female	Total	Male	Female	Total
1951									
	June 20	1 - Cape Lutke	PS	87	96	183	∞	∞	16
	July 10 and 14	2 - East Anchor Cove-Ikatan Bay	H	215	242	457	30	30	09
	July 17 and 20	3 - East Anchor Cove-Ikatan Bay	Т	157	201	358	17	16	33
	July 27-30	4 - Shumagin Islands	H	308	245	553	19	16	35
	Total			767	784	1,551	74	70	144
1952									
	July 19	5 - Shumagin Islands	L	44	40	84	18	20	38
	July 21	6 - Shumagin Islands	H	115	114	229	38	38	92
	July 22	7 - Shumagin Islands	T	29	53	120	23	19	42
	July 24	8 - Shumagin Islands	T	52	47	66	20	19	39
	July 25	9 - Shumagin Islands	T	29	48	115	17	20	37
	Total			345	302	647	116	116	232
1953									
	June 8-14	10 - Cape Lutke	PS	86	101	199	19	20	39
	June 15 and 17	11 - Cape Lutke	PS	38	35	73	20	24	44
	June 20	12 - Cape Lutke	PS	99	09	126	19	17	36
	June 20	13 - East Anchor Cove-Ikatan Bay	T	81	73	154	16	19	35
	June 22	14 - East Anchor Cove-Ikatan Bay	H	29	61	128	15	18	33
	June 29-30	15 - Chignik Bay	S and	T 319	172	491	32	34	99
	June 30	16 - East Anchor Cove-Ikatan Bay	T	121	114	235	20	16	36
	July 2	17 - East Anchor Cove-Ikatan Bay	T	108	102	210	18	18	36
	July 7 and 10	18 - Shumagin Islands	H	246	215	461	38	37	75
	July 17	19 - Shumagin Islands	H	117	121	238	19	20	39
							_		

taken in Alaska Peninsula commercial catch, 1951-57 -- Continued Table A-1. -- Particulars of measurements and scale samples of chum salmon (BS = Beach Seine, PS = Purse Seine, T = Trap, GN = Gill Net)

scales	le Total		38	39	38		554		417	73	287	145	89	116	86	74	284	75	290	35	39	97	144	20	38	92	40	37	2, 403
jo	Female		20	19	19		281		212	37	133	29	41	99	46	38	113	41	145	16	20	12	10	12	20	38	20	18	1, 155
Number	Male		18	70	19		273		205	36	154	80	48	09	52	36	171	34	145	19	19	14	74	œ	18	38	20	19	1,248
rements	Total		203	222	236		2,976		466	82	302	148	90	120	118	80	295	06	195	4	\$	27	154	20	40	87	40	40	2, 474
of measurements	Female		87	100	121		1,362		240	41	141	69	40	09	58	40	115	44	86	20	21	13	74	12	20	40	20	21	1, 187
Number	Male		116	122	115		1,614		226	41	161	42	20	09	09	40	180	46	26	20	19	14	80	œ	20	47	02	19	1,287
Gear	nsed		H	H	H				PS	BS	H	BS	BS	BS	H	BS	T	BS	BS	BS	US	UD	UD	UD	US	BS	US	CN	
	Sample number and location		20 - Shumagin Islands	21 - Shumagin Islands	22 - Shumagin Islands)			23 - Cape Lutke	- Kujuli	- 1	26 - Kujulik Bay	27 - Chignik Lagoon	28 - Chignik Lagoon	29 - Chignik Bay	30 - Kujulik Bay	31 - East Anchor Cove-Ikatan Bay	32 - Aniakchak Bay	33 - Herendeen Bay	34 - Herendeen Bay	35 - Bear River	36 - Moller Bay	37 - Bear River	38 - Nelson Lagoon	39 - Bear River	40 - Herendeen Bay	41 - Nelson Lagoon	42 - Nelson Lagoon	
	Date	1953 continued	July 21	July 24	July 27		Total	1954	Tune 10-20	June 18	June 18-22	June 22	June 23-24	June 25-27	June 27	June 30	July 5-9	July 7	July 9-10	July 14	July 15	July 16	July 16	July 16	July 19	July 24	July 25	July 28	Total

taken in Alaska Peninsula commercial catch, 1951-57 -- Continued (BS = Beach Seine, PS = Purse Seine, T = Trap, GN = Gill Net) Table A-1. --Particulars of measurements and scale samples of chum salmon

			N. I.			N.T.	J	
		Cear	Number of measurements	measur	ements	Numbe	Number of scales	Tes
Date	Sample number and location	nsed	Male Fe	emale	Total	Male	Female	Tota
1955								
June 14-18	43 - Cape Lutke	PS	20	36	98	23	18	41
June 17-21.	44 - East Anchor Cove-Ikatan Bay	Ţ	39	44	83	97	21	47
June 26	45 - East Anchor Cove-Ikatan Bay	⊣	16	10	97	10	80	18
June 29	46 - East Anchor Cove-Ikatan Bay	T	13	15	28	15	13	28
July 1	47 - Izembek Bay	BS	37	35	72	20	18	38
July 5	48 - Izembek Bay	BS	54	97	80	18	19	37
July 7	49 - Izembek Bay	BS	21	53	20	19	70	39
July 9	50 - Izembek Bay	BS	13	22	35	13	70	33
July 12	51 - Izembek Bay	BS	51	20	101	20	18	38
July 13	52 - Izembek Bay	BS	44	46	06	19	19	38
July 13	53 - East Anchor Cove-Ikatan Bay	H	0	0	0	∞	80	16
July 16-20	54 - Izembek Bay	BS	144	143	287	46	49	86
July 17	55 - Pavlof Bay	H	28	22	50	16	19	35
July 20-23	56 - Pavlof Bay	Т	30	39	69	56	59	55
Total			540	517	1,057	282	279	561
1956								
June 18-22	57 - Cape Lutke	PS	56	14	40	25	12	37
June 23	58 - East Anchor Cove-Ikatan Bay	⊣	92	20	146	39	35	74
June 25	59 - Cape Lutke	PS	55	63	118	38	39	77
June 28-29	60 - Izembek Bay	BS	102	29	161	26	54	110
June 30	61 - East Anchor Cove-Ikatan Bay	PS	86	80	178	36	40	92
July 3-5	62 - East Anchor Cove-Ikatan Bay	H	124	144	268	61	64	125
July 9-13	63 - Izembek Bay	BS	438	305	743	157	156	313
July 16	64 - Izembek Bay	BS	46	96	193	37	40	22
July 17	65 – Izembek Bay	BS	17	18	35	15	17	32

Table A-1. --Particulars of measurements and scale samples of chum salmon taken in Alaska Peninsula commercial catch, 1951-57 -- Continued (BS = Beach Seine, PS = Purse Seine, T = Trap, GN = Gill Net)

		2007	Imphar	of meser	Number of mesentements	Numbe	Number of scales	2)00
		•	TOGITTO	or Hicaso	T CHICHES	TAMILION	10 10	GICS
Date	Sample number and location	nsed	Male	Female	Total	Male	Female	e Total
1956 continued								
July 18	66 - Izembek Bay	BS	42	64	143	40	40	80
July 19	67 - Izembek Bay	BS	47	45	92	39	39	28
July 19	68 - Pavlof Bay	Т	20	19	39	18	18	36
July 20	69 - Izembek Bay	BS	99	44	100	39	38	77
Tuly 23	70 - Izembek Bay	BS	20	89	138	37	4	77
Tuly 24	71 - Izembek Bay	BS	61	70	131	40	38	78
July 27	72 - Pavlof Bay	H	99	46	102	40	38	78
July 30	73 - Pavlof Bay	H	82	98	168	39	39	78
July 30	74 - Izembek Bay	BS	37	48	85	36	40	92
Total			1,541	1,339	2,880	79.2	787	1,579
1957								
Tune 20-21	75 - Cape Lutke	PS	43	09	103	34	51	85
Tune 21-22	76 - East Anchor-Ikatan Bay	GN and T		92	195	53	36	86
Tune 30	77 - Ivanof Bav	PS		47	176	37	35	72
Tuly 3 -9	78 - Izembek Bav	BS		85	196	58	57	115
Tuly 8 and 12	79 - St. Catherine Cove	BS		211	408	62	74	153
Tuly 16-17	- Izem	BS		84	184	39	39	78
July 25	81 - East Anchor Cove-Ikatan Bay	Ţ		80	181	39	36	75
Total			800	643	1,443	339	328	299

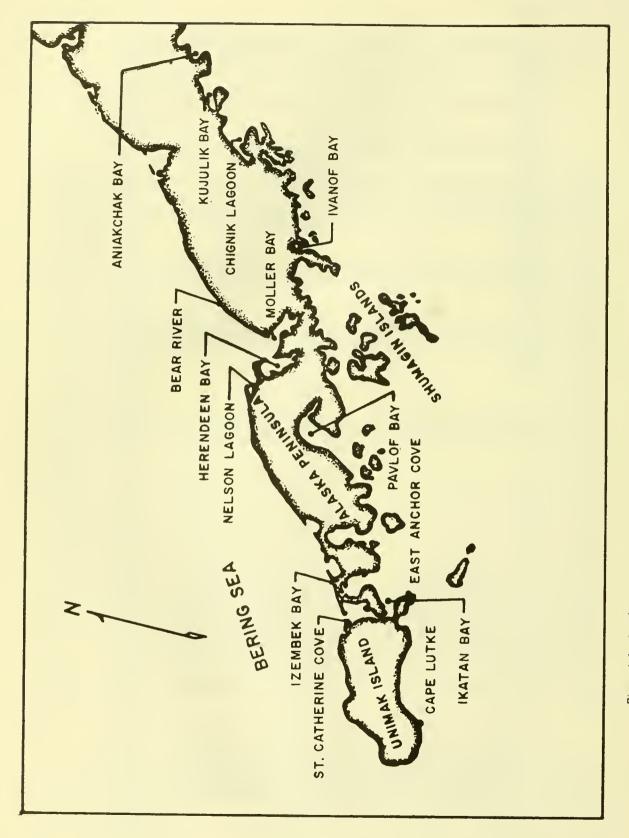


Figure A-1.--Localities where chum salmon samples were taken in the Alaska Peninsula commercial catch, 1951-57.

Table A-2. -- Length frequencies of Alaska Peninsula chum salmon by age (in years) and sex, 1951-57

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Table A-2. -- Length frequencies of Alaska Peninsula chum salmon by age (in years) and sex, 1951-57 - Continued

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Table A-2. -- Length frequencies of Alaska Peninsula chum salmon by age (in years) and sex, 1951-57 - Continued

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Table A-2. --Length frequencies of Alaska Peninsula chum salmon by age (in years) and sex, 1951-57 - Continued

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Table A-2. -- Length frequencies of Alaska Peninsula chum salmon by age (in years) and sex, 1951-57 - Continued

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Table A-2. -- Length frequencies of Alaska Peninsula chum salmon by age (in years) and sex, 1951-57 - Continued

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Table A-2. -- Length frequencies of Alaska Peninsula chum salmon by age (in years) and sex, 1951-57 - Continued

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Table A-2. -- Length frequencies of Alaska Peninsula chum salmon by age (in years) and sex, 1951-57 - Continued

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. Table A-2. -- Length frequencies of Alaska Peninsula chum salmon by age (in years) and sex, 1951-57 - Continued

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Table A-2. -- Length frequencies of Alaska Peninsula chum salmon by age (in years) and sex, 1951-57 - Continued

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Table A-2. -- Length frequencies of Alaska Peninsula chum salmon by age (in years) and sex, 1951-57 - Continued

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Length	by centi-	meter	group	(mm.)			505	515	525	535	545	555	565	575	585	595	909	615	625	635	645	655	. 599	675	685	695	705	715	725	735	745	755	500	759	Total

Table A-2. -- Length frequencies of Alaska Peninsula chum salmon by age (in years) and sex, 1951-57 - Continued

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Length	by centi-	meter	group	(mm.)			505	515	525	535	545	555	565	575	585	595	909	615	625	635	645	655	999	675	685	969	705	715	725	735	745	755	500	759	

Table A-2. -- Length frequencies of Alaska Peninsula chum salmon by age (in years) and sex, 1951-57 - Continued

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Table A-2. -- Length frequencies of Alaska Peninsula chum salmon by age (in years) and sex, 1951-57 - Continued

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Table A-2. -- Length frequencies of Alaska Peninsula chum salmon by age (in years) and sex, 1951-57 - Continued

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Table A-2. -- Length frequencies of Alaska Peninsula chum salmon by age (in years) and sex, 1951-57 - Continued

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Table A-2. --Length frequencies of Alaska Peninsula chum salmon by age (in years) and sex, 1951-57 - Continued

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Table A-3. Chum salmon sex ratios, Alaska Peninsula area, 1951-57

Date	Sample number and location	Male	Female	Both
1951				
June 20	1 - Cape Lutke	87	96	183
July 10 and 14	2 - East Anchor Cove-Ikatan Bay	215	242	457
July 17 and 20	3 - East Anchor Cove-Ikatan Bay	157	201	358
July 27-30	4 - Shumagin Islands	308	245	553
Total		767	784	1,551
Percent		49.4	50.6	100.0
1952				
July 19	5 - Shumagin Islands	44	40	84
July 21	6 - Shumagin Islands	115	114	229
July 22	7 - Shumagin Islands	67	53	120
July 24	8 - Shumagin Islands	52	47	99
July 25	9 - Shumagin Islands	67	48	115
Total		345	302	647
Percent		5 3.3	46.7	100.0
1953				
June 8-14	10 - Cape Lutke	98	101	199
June 15 and 17	11 - Cape Lutke	38	35	73
June 20	12 - Cape Lutke	66	60	126
June 20	13 - East Anchor Cove-Ikatan Bay	81	73	154
June 22	14 - East Anchor Cove-Ikatan Bay	67	61	128
June 29-30	15 - Chignik Bay	319	172	491
June 30	16 - East Anchor Cove-Ikatan Bay	121	114	235
July 2	17 - East Anchor Cove-Ikatan Bay	108	102	210
July 7 and 10	18 - Shumagin Islands	246	215	461
July 17	19 - Shumagin Islands	117	121	238
July 21	20 - Shumagin Islands	116	87	203
July 24	21 - Shumagin Islands	122	100	222
July 27	22 - Shumagin Islands	115	121	236
Total		1,614	1,362	2,976
Percent		54.2	45.8	100.0

Table A-3. Chum salmon sex ratios,
Alaska Peninsula area, 1951-57 -- Continued

Date	Sample number and location	Male	Female	Both
1954				
June 10-20	23 - Cape Lutke	226	240	466
June 18	24 - Kujulik Bay	41	41	82
June 18-22	25 - East Anchor Cove-Ikatan Bay	161	141	302
June 22	26 - Kujulik Bay	79	69	148
June 23-24	27 - Chignik Lagoon	50	40	90
June 25-27	28 - Chignik Lagoon	60	60	120
June 27	29 - Chignik Bay	60	58	118
June 30	30 - Kujulik Bay	40	40	80
July 5-9	31 - East Anchor Cove-Ikatan Bay	180	115	295
July 7	32 - Aniakchak Bay	46	44	90
July 9-10	33 - Herendeen Bay	97	98	195
July 14	34 - Herendeen Bay	20	20	40
July 15	35 - Bear River	19	21	40
July 16	36 - Møller Bay	14	13	27
July 16	37 - Bear River	80	74	154
July 16	38 - Nelson Lagoon	8	12	20
July 19	39 - Bear River	20	20	40
July 24	40 - Herendeen Bay	47	40	87
July 25	41 - Nelson Lagoon	20	20	40
July 28	42 - Nelson Lagoon			
July 20	42 - Neison Lagoon	19	21	40
Total		1,287	1,187	2,474
Percent		52.0	48.0	100.
1 955				
June 14-18	43 - Cape Lutke	50	36	86
June 17-21	44 - East Anchor Cove-Ikatan Bay	39	44	83
June 26	45 - East Anchor Cove-Ikatan Bay	16	10	26
June 29	46 - East Anchor Cove-Ikatan Bay	13	15	28
July 1	47 - Izembek Bay	37	35	
July 5	48 - Izembek Bay	54		72
July 7	49 - Izembek Bay		26	80
*		21	29	50
July 9	50 - Izembek Bay	13	22	35
July 12	51 – Izembek Bay 52 – Izembek Bay	51	50	101
T.,1 1.2	7/ = IZAMARK MAY	44	46	90
July 13	•	•		0
July 13	53 - East Anchor Cove-Ikatan Bay	0	0	
July 13 July 16-20	53 - East Anchor Cove-Ikatan Bay 54 - Izembek Bay	144	143	287
July 13 July 16-20 July 17	53 - East Anchor Cove-Ikatan Bay 54 - Izembek Bay 55 - Pavlof Bay	144 28	143 22	28 7 50
July 13 July 16-20	53 - East Anchor Cove-Ikatan Bay 54 - Izembek Bay	144	143	287
July 13 July 16-20 July 17	53 - East Anchor Cove-Ikatan Bay 54 - Izembek Bay 55 - Pavlof Bay	144 28	143 22	28 7 50

Table A-3. Chum salmon sex ratios,
Alaska Peninsula area, 1951-57 -- Continued

Date	Sample number and location	Male	Female	Both
1956		,	······································	··· · · · ·
June 18-22	57 - Cape Lutke	26	14	40
June 23	58 - East Anchor Cove-Ikatan Bay	76	70	146
June 25	59 - Cape Lutke	55	63	118
June 28-29	60 – Izembek Bay	102	59	161
June 30	61 - East Anchor Cove-Ikatan Bay	98	80	178
July 3-5	62 - East Anchor Cove-Ikatan Bay	124	144	268
July 9-13	63 – Izembek Bay	438	305	743
July 16	64 – Izembek Bay	97	96	193
July 17	65 – Izembek Bay	17	18	35
July 18	66 – Izembek Bay	7 9	64	143
July 19	67 - Izembek Bay	47	45	92
July 19	68 - Pavlof Bay	20	19	39
July 20	69 – Izembek Bay	56	44	100
July 23	70 - Izembek Bay	70	68	138
July 24	71 - Izembek Bay	61	70	131
July 27	72 - Pavlof Bay	56	46	102
July 30	73 - Pavlof Bay	82	86	168
July 30	74 – Izembek Bay	37	48	85
Total		1,541	1,339	2,880
Percent		53.5	46.5	100.0
1957				
June 20-21	75 - Cape Lutke	43	60	103
June 21-22	76 - East Anchor Cove-Ikatan Bay	119	76	195
June 30	77 - Ivanof Bay	129	47	176
July 3-9	78 – Izembek Bay	111	85	196
July 8 and 12	79 - St. Catherine Cove	197	211	408
July 16-17	80 – Izembek Bay	100	84	184
July 25	81 - East Anchor Cove-Ikatan Bay	101	80	181
Total		800	643	1,443
Percent		55.4	44.6	100.0

APPENDIX

В.	Biological	Statistics for	Chum Salmoi	i, Kodiak Island a	area, 1948-51	and 1955-57

Table B-1. -- Particulars of measurements and scale samples of chum salmon (BS = Beach Seine, PS = Purse Seine, T = Trap, GN = Gill Net) taken in Kodiak commercial catch, 1948-1951 and 1955-1957

			Gear	Number	of measurements	ements	Number	Jo	scales
Date		Sample number and location	nsed	Male	Female	Total	Male	Female	Total
1948									
June 22	22	1 - Karluk Beach	BS	71	30	101	10	5	15
July 29	62	2 - Spirldon Bay	PS	101	105	506	28	27	52
August	8t 4	3 - Uyak Bay	H	102	100	202	23	53	52
August	st 5	4 - Uyak Bay	H	65	89	133	97	53	52
August 7	st 7	5 - Uyak Bay	Н	86	102	200	28	30	58
Total				437	405	842	115	120	235
1949									
July 7	2	6 - Olga and Moser Bays	S	09	100	160	28	27	52
July	July 12 and 15	Bay	PS	06	47	137	53	97	52
July 16	16	8 - Kiliuda Bay	PS	101	77	178	27	97	53
July 25	25	9 - Uganik Bay	PS	100	100	200	29	56	28
July 28	28	10 - Spiridon Bay	PS	66	101	200	29	24	53
July 30	30	11 - East Uyak Bay	H	66	101	200	23	23	46
Total				549	526	1,075	165	155	320
1950									
July 12	12	12 - Raspberry Island	T	50	50	100	20	18	38
August 3	st 3	13 - East Uyak Bay	H	803	100	183	20	19	39
August 8	st 8	14 - Head Uyak Bay	PS	59	51	110	18	19	37
Total				192	201	393	58	99	114

taken in Kodiak commercial catch, 1948-1951 and 1955-1957 -- Continued Table B-1. -- Particulars of measurements and scale samples of chum salmon (BS = Beach Seine, PS = Purse Seine, T = Trap, GN = Gill Net)

			Mr. and L. o.	3	1000	NT.	Minney be - of and a	ŀ
		Gear	Mariner	Muliber of illeasurements	Tients	Manne	Demole	
Date	Sample number and location	nsed	мале	remale	Lotal	Male	r emale	Total
1951 August 4	15 - Uganik Bay	L	62	59	121	19	18	37
Total			62	59	121	19	18	37
1955								
July 12	16 - Spiridon Bay	PS	10	41	51	10	37	47
July 14	17 - Zachar Bay	PS	52	64	116	37	34	71
July 19	18 - Spiridon Bay	PS	84	80	164	83	77	160
July 20	- 1	PS	17	24	41	16	20	36
Total			163	506	372	146	168	314
1056								
1950 July 13	20 - Zachar Bav	PS	42	40	82	19	18	37
July 21	- South U	PS	118	93	211	19	20	39
			160	133	293	90	38	92
Total			204					
1957								
July 8	22 - South Uyak Bay	PS	33	19	52	14	16	30
July 9	23 - Zachar Bay	PS	36	23	59	36	20	99
July 9		PS	93	85	178	17	18	35
July 23	1	PS	91	110	201	49	47	96
July 26	- 1	PS	108	128	236	35	33	89
Total			361	365	726	151	134	285



Figure B-1,--Localities where chum salmon samples were taken in Kodiak Island commercial catch, 1948-51 and 1955-57.

Table B-2. -- Length frequencies of Kodiak area chum salmon by age (in years) and sex, 1948-51 and 1955-57.

Sample No. 1 Sample No. 2 Sample No. 3 Sample No. 4 Karluk Beach Spiridon Bay Uyak Bay Uyak Bay Uyak Bay June 22, 1948 July 29, 1948 August 4, 1948 August 5, 1948 Male Female Male Female Female 3 4 5 3	Sample No. 5		August 77, 1948		Female	5 3 4 5				1 3			1 2	1 3	1 1 3	3	2	1 3 1	1 1			-							7,00	ng to		
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Table B-2.--Length frequencies of Kodiak arm chum salmon by age (in years) and sex, 1948-51 and 1955-57

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Table B-2. -- Length frequencies of Kodiak area chum salmon by age (in years) and sex, 1948-51 and 1955-57

Table B-2. --Length frequencies of Kodiak area chum salmon by age (in years) and sex, 1948-51 and 1955-57

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Table B-2. -- Length frequencies of Kodiak area chum salmon by age (in years) and sex, 1948-51 and 1955-57

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Table B-2. -- Length frequencies of Kodiak area chum salmon by age (in years) and sex, 1948-51 and 1955-57

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	56	>		2.2	age	Femal	4									2	3	9	3	5	9	4		7	7											33
	Vo.	Spiridon Bay	,	1957	and a	ഥ	3																											_		
	Sample No.	lon		6,			5																													7
ı	mp	iric		July 26,	Sex	Male	4										4	_	_	S	3	3	7	3	3	7										7
	Sa	Sp		Ju		Σ	3					-			7	7		7	-	-																0
	Length	by centi-	meter	group	(mm.)			505	515	525	535	545	555	565	575	585	595	909	615	625	635	645	655	999	675	685	969	705	715	725	735	745	755	200	> 759	Total
																Ē	4																	•		

Table B-3. Chum salmon sex ratios for the Kodiak area, 1948-51 and 1955-57

Date	Sample number and location	Male	Female	Both
1948				
June 22	l – Karluk Beach	70	30	100
July 29	2 - Spiridon Bay	101	73	174
August 4	3 - Uyak Bay	85	100	185
August 5	4 - Uyak Bay	64	68	132
August 7	5 - Uyak Bay	65	102	167
Total		385	373	758
Percent		50.8	49.2	100.0
1949				
July 7	6 - Olga and Moser Bays	36	100	136
July 12 and 15	7 - Kaguyak Bay	90	46	136
July 16	8 – Kiliuda Bay	100	69	169
July 25	9 - M ush Bay	100	88	188
July 28	10 - Spiridon Bay	50	32	82
July 30	II - East Uyak Bay	93	100	193
Total		469	435	904
Percent		51.9	48.1	100.0
1950				
July 15	12 - Rasberry Island	65	47	112
August 3	13 - East Uyak Bay	83	100	183
August 8	14 - Head Uyak Bay	52	66	118
Total		200	213	413
Percent		48.4	51.6	100.0
1951				
August 4	15 - Uganik Bay	62	75	137
Total		62	75	137
Percent		45.3	54.7	100.0

Table B-3. Chum salmon sex ratios for the Kodiak area, 1948-51 and 1955-57 -- Continued

Date	Sample number and location	Male	Female	Both
1955				
July 12	16 - Spiridon Bay	10	26	36
July 14	17 - Zachar Bay	52	64	116
July 19	18 - Spiridon Bay	84	80	164
July 20	19 - Spiridon Bay	17	24	41
Total		163	194	357
Percent		45.7	54.3	100.0
1956				
July 13	20 - Zachar Bay	67	62	129
July 21	21 - South Uyak Bay	115	91	206
Total		182	153	335
Percent		54.3	45.7	100.0
1957				
July 8	22 - South Uyak Bay	35	19	54
July 9	23 - Zachar Bay	38	24	62
July 9	24 - South Uyak Bay	93	85	178
July 23	25 - South Uyak Bay	90	108	198
July 26	26 - S piridon Bay	113	132	245
Total		369	366	735
Percent		50.2	49.8	100.0

APPENDIX

C.	Biological	Statistics fo	or Chum	Salmon,	Prince	William	Sound area,	1952-58

57

Prince William Sound commercial fishery, 1952-1953 and 1956-1958 (BS = Beach Seine, PS = Purse Seine, T = Trap, GN = Gill Net) Table C-1. -- Particulars of measurements and scale samples taken in the

		Gear	Number	Number of measurements	ements	Number of scales	of scal	68
Date	Sample number and location	nsed	Male	Female	Total	Male	Female	Total
1952						l I		
August 6	l - Montague Island	Н	99	95	148	20	18	38
August 12	2 - Port Gravina - Sheep Bay	PS	82	100	182	19	20	39
August 12	3 - Unakwik - Port Fidalgo	PS	20	20	40	20	18	38
Total			158	212	3.70	59	56	115
1953								
July 15	4 - Montague Strait - Knight Island	nd T	74	101	175	20	19	39
July 21	5 - Montague Strait - Bainbridge							
	Island	H	94	66	193	19	18	37
August 3	6 - Eshamy Bay	SN	35	50	85	19	20	39
August 5	7 - Montague Strait	H	86	100	198	20	18	38
August 5	8 - Port Chalmers - Knight							
	Island Pass	PS	50	74	124	18	18	36
Ē			1		Į	Ì		
rotal			351	474	S)	96	93	189
1956								
June 25	9 - Galena Bay	BS	72	0	'n	0	0	0
June 27	10 - Unakwik Inlet	PS	0	4	4	0	*	4
July 10	11 - Port Wells	PS	50	50	100	18	19	37
July 10-11	12 - MacLeod Harbor-Point Helen	H	50	50	100	18	16	34
July 16-17	13 - Montague Strait - Knight							
	Island Passage	Η	32	42	74	0	0	0
July 19	14 - Port Wells	PS	46	42	88	19	19	38
July 19	15 - Valdez Arm	PS	15	16	31	14	15	56

Table C-1. --Particulars of measurements and scale samples taken in the Prince William Sound commercial fishery, 1952-1953 and 1956-1958 -- Continued (BS = Beach Seine, PS = Purse Seine, T = Trap, GN = Gill Net)

		Gear	Number of measurements	f measur	ements	Numb	Number of scales	les
Date	Sample number and location	pesn	Male	Female	Total	Male	Female	Total
1956 continued								
July 20	16 - MacLeod Harbor	Ţ	0	0	0	18	19	37
July 20	17 - Valdez Arm	PS	31	38	69	0	0	0
July 24	18 - Montague Strait - Knight							
	Island Passage	H	74	74	148	18	20	38
August 2	19 - Hinchinbrook Island - Ports							
	Gravina and Fidalgo	H	0	0	0	20	19	39
August 3	20 - New England Fish Company -							
	Ellamar	Т	50	47	46	19	20	39
August 3	21 - Valdez - Port Fidalgo	PS	48	20	86	20	20	40
August 1 - 4	22 - Granite Bay Point	H	23	20	43	20	18	38
Total			424	433	857	184	189	373
1957								
July 8	23 - Point Helen	H	53	46	66	0	0	0
July 9	24 - Point Helen	T	13	13	97	0	0	0
July 11	25 - Culross Island	PS	2	4	6	0	0	0
July 13 - 14	26 - Porcupine Point	Ħ	25	17	45	0	0	0
July 14	27 - Point Freemantle	Н	45	25	20	0	0	0
July 21	28 - Bainbridge Point	Ħ	12	80	20	0	0	0
July 22	29 - North Twin Bay	PS	2	2	4	0	0	0
July 23	30 - Point Elrington	PS	4	2	=======================================	0	0	0
July 26	31 - Montague Strait - Knight							
	Island Passage	H	48	51	66	19	19	38
July 28	32 - MacLeod Harbor	H	24	27	51	0	0	0
July 31	33 - Kiniklik Point	Ţ	9	0	9	0	0	0

Prince William Sound commercial fishery, 1952-1953 and 1956-1958 -- Continued (BS = Beach Seine, PS = Purse Seine, T = Trap, GN = Gill Net) Table C-1, --Particulars of measurements and scale samples taken in the

			Gear	Number o	of measurements	ments	Numpe	Number of scales	les
Date		Sample number and location	nsed	Male	Female	Total	Male	Female	Total
1957	continued								
	August 3	34 - Gravina Point	H	97	11	37	0	0	0
	August 4	35 - Porcupine Point	H	61	54	115	0	0	0
	August 8	36 - Point Elrington	H	13	17	30	0	0	0
	August 10-11	37 - Bainbridge Point	H	15	59	4	0	0	0
	August 12	38 - MacLeod Harbor	PS	7	0	7	0	0	0
	August 13	39 - Zaikof Bay	BS	1	0	1	0	0	0
	Total			355	311	999	19	19	38
	- 11								
1958					;	ì		(
	July 6	40 - Culross Island	H	15	11	97	15	6	77
	July 7	41 - Point Helen	H	10	15	52	*	νς.	6
	July 8	42 - Point Helen	H	13	21	34	0	0	0
	July 9	43 - Point Freemantle	H	11	15	56	0	0	0
	July 12	44 - Johnstone Point	Н	38	42	80	70	19	39
	July 14	45 - Point Helen	H	23	27	20	16	18	34
	July 15	46 - Point Elrington	PS	e	12	15	0	0	0
	July 16	- Point	PS	-	0		0	0	0
	July 20	48 - Point Freemantle	Н	107	83	190	0	0	0
	July 23	49 - Johnstone Point	H	37	33	8	0	0	0
	July 29	50 - Kiniklik Point	PS	13	14	27	0	0	0
	July 30	51 - Point Freemantle	H	34	53	63	0	0	0
	August 3	52 - Johnstone Point	H	20	10	30	15	10	25
	August 6	53 - Point Helen	H	6	2	14	9	4	01
	August 7-8	54 - Point Elrington	PS	-	2	3	0	0	0
	Total			335	319	654	92	99	141

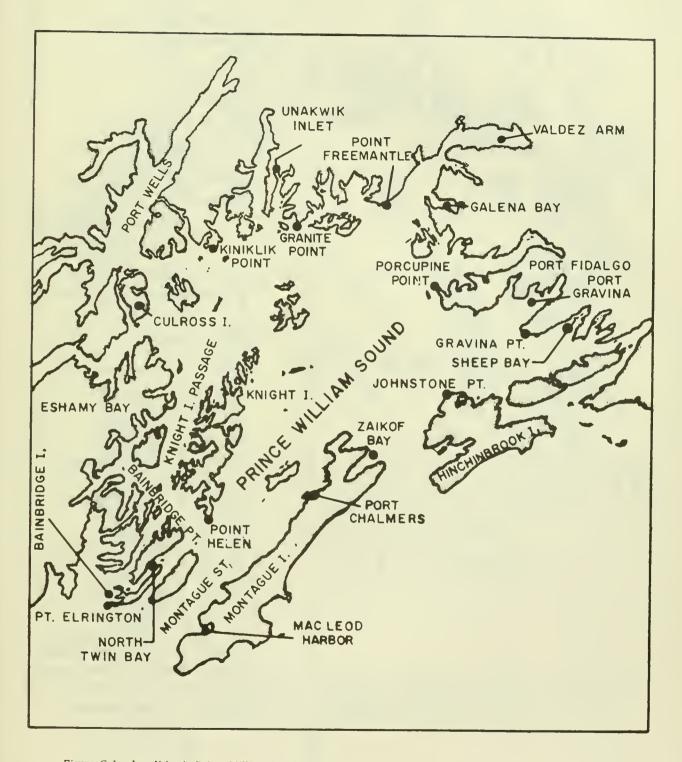


Figure C-1.--Localities in Prince William Sound where chum salmon samples were taken in the commercial catch, 1952-53 and 1956-58.

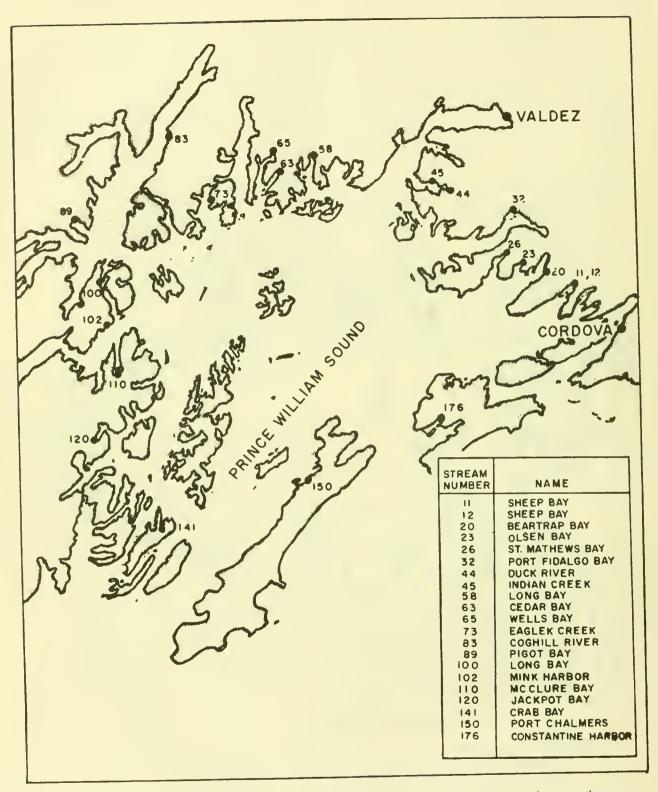


Figure C-2.--Stream locations in Prince William Sound where chum salmon spawning ground samples were taken, 1952-57.

Table C-2. -- Particulars of measurements and scale samples taken from the Prince William Sound spawning grounds, 1952-1957 (E = Early, M = Middle, L = Late run streams)

				Number	Number of measurements	rements	Numb	Number of scales	les
Date		Sample number and location 1/	Timing	Male	Female	Total	Male	Female	Total
1952									
Aug	August 15	1 - Sheep Bay (11)	ᆈ	10	36	46	18	19	37
Aug	August 20	2 - Duck River (44)	×	41	52	93	20	15	35
Sept	September 4	3 - Constantine Harbour (176)	M	52	45	9.2	0	0	0
Sept	September 11	4 - Sheep Bay (11)	딢	25	19	44	0	0	0
Total	72			128	152	280	38	34	72
1953									
July 23	. 23	5 - Sheep Bay (11)	딢	46	52	86	18	91	34
July 24	. 24	6 - Beartrap Bay (20)	A	27	38	65	18	18	36
July 25	. 25	7 - Olsen Bay (23)	듸	62	34	63	17	17	34
July 27	. 27	8 - Indian Creek (45)	a	18	27	45	18	17	35
August	ust 1	9 - Coghill River (83)	×	13	15	28	17	18	35
Aug	August 4	10 - Jackpot Bay (120)		40	6	49	17	∞	52
Augr	August 10	11 - Olsen Bay (23)	a	24	27	51	14	19	33
Augr	August 12	12 - Constantine Harbour (176)	×	19	10	53	18	∞	97
August	ust 17	13 - Duck River (44)	M	80	44	124	91	19	35
August	ust 17	14 - Indian Creek (45)	ᄓ	0	7	-	0	_	1
Augr	August 18	15 - East Long Bay (58)	M	4	1	7.	ν.	_	9
Augn	August 18	16 - Cedar Bay (63)	7	2	7	m	7	-	3
Aug	August 19	17 - Wells Bay (65)	×	3	က	9	3	3	9
Aug	August 21	18 - Pigot Bay (89)	回	-	œ	6	-	9	7
						=			

1/ Number in parenthesis is number assigned by Fish and Wildlife Service to identify streams

the Prince William Sound spawning grounds, 1952-1957 -- Continued (E = Early, M = Middle, L = Late run streams) Table C-2. -- Particulars of measurements and scale samples taken from

				Number	Number of measurements	ements	Numb	Number of scales	les
Date		Sample number and location $\frac{1}{2}$	Timing -	Male	Female	Total	Male	Female	Total
1953	continued					1		ĵ	,
•	August 21	19 - Long Bay (100)	긔	49	46	95	19) 1	0 1
	Angust 22	20 - Mink Harbour (102)	니	1	4	Ś		4	ኅ
	Anonst 24	21 - Jackpot Bay (120)	ᄓ	29	57	124	20	18	38
	August 27	22 - South Port Chalmers (150)	긔	4	2	9	4	7	9
	Angust 28	23 - Constantine Harbour (176)	×	44	42	98	18	19	37
	August 31	24 - Sheep Bay (11)	ы	13	19	32	12	16	28
	August 31	25 - Sheen Bay (12)	M	48	30	80	18	18	36
	August 31	26 - Olsen Bav (23)	E	37	24	61	19	13	32
	September 2	27 - Reartran Bay (20)	巨	54	50	104	19	17	36
		28 Ct Mathams Bay (26)	Σ .	ıΩ	2	7	4	2	9
		20 - 30: Maniews Day (20)	-	_	1	2	П	1	7
	September 5		1 >	· 00	17	55	15	13	28
	September o	30 - Long Day (30)	X	16	ω	24	16	∞	24
	september (31 - Eagler Oleen (13)	1						
	Total			683	572	1,255	330	300	630
1054									
1011	American 16	32 - Sheep Bay (11)	Þ	19	16	35	18	16	34
	August 22	33 - Cedar Bay (63)	1	6	Ŋ	14	0	0	0
	August 24	34 - Faolek Creek (73)	M	87	59	116	39	27	99
	in length								
	Total			115	50	165	57	43	100

1/ Number in parenthesis is number assigned by Fish and Wildlife Service to identify streams.

the Prince William Sound spawning grounds, 1952-1957 -- Continued Table C-2. -- Particulars of measurements and scale samples taken from (E = Early, M = Middle, L = Late run streams)

				Number o	of measurements	ements	Number	er of scales	les
Date		Sample number and location 1/	Timing	Male	Female	Total	Male	Female	Total
1955	Angust 21		Ļ	6	œ	1.7	σ	00	17
	September 4	36 - Duck River (44)	ıΣ	33	41	74	19	19	38
	Total			42	49	91	28	27	55
1956									
	August 16	37 - McClure Bay (110)	\mathbb{X}	17	21	38	15	14	56
			×	53	64	117	18	18	36
			×	38	61	66	18	16	34
			니	51	32	83	19	17	36
			×	36	43	42	0	0	0
			M	38	55	93	20	18	38
			니	59	69	128	18	17	35
			딘	33	52	85	18	18	36
	August 31	7 (23)	딘	35	19	54	0	0	0
	September 9	(100)	ı	33	55	88	0	0	0
	Total			393	471	864	126	118	244
1957									
	August 15	47 - Jackpot Bay (120)	回	55	54	109	52	54	109
	August 17	(N68)	딢	48	52	100	0	0	0
	August 23		×	20	22	42	20	18	38
	August 25	50 - Sheep Bay (11)	旦	702	20	40	17	16	33
	Total			143	148	291	92	88	180

1/ Number in parenthesis is number assigned by Fish and Wildlife Service to identify streams.

Table C-3. --Length frequencies of chum salmon taken in Prince William Sound commercial fishery by age (in years)

	ī.	Montague Strait-	Bainbridge Island	1953		Female	3 4 5									1 1	2	1 1	2	2	2	1	2	2 1												2 15 1
	Sample No	gue	idge			_	5			-	-	-	-	-						_	1				2											3
	nple	nta	inbr	ly 21,		le	4						ertrego.		*******	a yerrac	(mettod)	3		4	3	2	2		1						and the same					1.5
	Sa	Ĭ,	Ba	July		Male	3										7																			-
						e	5														1															_
	4,	ait-	_	_		emale	4									~	2	3	3	4	2			M 7074 & A					er constant							16
		Str	land	1953		Fe	3					_	-	-		7	1	-					_									-		-		2
	Z e	gue	t Is	- 1			5															-														~
	Sample No	Montague Strait-	Knight Island	July 15,		Male	4									-	2	2	-	2	3		2			_		-	1							16
- 1	S	Σ ;	것	J		Σ	3				-			_											- A. Dangton		The state of			1						~
8641-9641 pur 6641-261						le	5														_	1	4													7
666	m .	r T		1952		emale	4									-		1			2	out Commission		1-476-00												4
ng	S S	Unakwik-Port		12, 1		ഥ	3							-			5	I	2																	0
25 a	le l	wik			age		5							B 10000-1		Y4 :	are 70.000				* 3 market / Au					-	-									
-13	Sample	nak	Fidalgo	August	and a	Male	4		_	_		L						1			2	3	7	7	_	~									L.	0
726				- 4		2	3		_	_					_			2	2	_													Н			9
sex, 1	Sample No. 2	reep			Sex	le	2												ī							2	1									4
ָם מ	7	a-Sl		1952		emal	4						7				7		-	-	3	1	2				1									=
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Table C-3, -- Length frequencies ofchum salmon taken in Prince William Sound commercial fishery by age (in years) and sex. 1952-1953 and 1956-1958 -- Continued

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Table C-3. --Length frequencies of chum salmon taken in Prince William Sound commercial fishery by age (in years)

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Table C-3. --Length frequencies of chum salmon taken in Prince William Sound commercial fishery by age (in years)

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Table C-3. --Length frequencies of chum salmon taken in Prince William Sound commercial fishery by age (in years)

Table C-3. -- Length frequencies of chum salmon taken in Prince William Sound commercial fishery by age (in years)

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Table C-4. -- Length frequencies of chum salmon taken from the Prince William Sound spawning grounds by age (in years) and sex 1952-1957 -- Continued

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Table C-4. -- Length frequencies of chum salmon taken from the Prince William Sound spawning grounds by age

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Table C-4. --Length frequencies of chum salmon taken from the Prince William Sound spawning grounds by age (in years) and sex, 1952-1957 --Continued

			(in years)	rs) and		sex, 1936-1931	77-70											
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Table C-4, --Length frequencies of chum salmon taken from the Prince William Sound spawning grounds by age (in vears) and sex. 1952-1957 --Continued

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Table C-4. -- Length frequencies of chum salmon taken from the Prince William Sound spawning grounds by age rs) and sex 1952_1957 -- Continued

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Table C-4. -- Length frequencies of chum salmon taken from the Prince William Sound spawning grounds by age (in years) and sex. 1952-1957

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Table C-4. --Length frequencies of chum salmon taken from the Prince William Sound spawning grounds by age (in years) and sex, 1952-1957 --Continued

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Table C-4--. Length frequencies of chum salmon taken from the Prince William Sound spawning grounds by age

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Table C-4. --Length frequencies of chum salmon taken from the Prince William Sound spawning grounds by age (in years) and sex, 1952-1957 --Continued

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Table C-5. Chum salmon sex ratios for the Prince William Sound area commercial catch, 1952-53 and 1956-58

Date	Sample number and location	Male	Female	Both
1952				
August 6	1 - Montague Island	56	92	148
August 12	2 - Port Gravina-Sheep Bay	82	100	182
August 12	3 - Unakwik-Port Fidalgo	20	13	33
Total		158	205	363
Percent		43.5	56.5	100.0
1953				
July 15 July 21	4 - Montague Strait-Knight Island 5 - Montague Strait-Bainbridge	62	100	162
Í	Island	70	99	169
August 3	6 - Eshamy	22	50	72
August 5	7 - Montague Strait	61	100	161
August 5	8 - Port Chalmers-Knight Island		-	
, and the second	Passage	44	74	118
Total		259	423	682
Percent		38.0	62.0	100.0
1956				
June 25	9 - Galena Bay	5	0	5
June 27	10 - Unakwik Inlet	0	4	4
July 10	11 - Port Wells	50	39	89
July 10-11	12 - MacLeod Harbor-Point Helen	50	39	89
July 16-17	13 - Montague Strait-Knight Island	30	37	
	Passage	30	42	72
July 19	14 - Port Wells	50	45	95
July 19	15 - Valdez Arm	15	16	31
July 20	16 - MacLeod Harbor	42	50	92
July 20	17 - Valdez Arm	29	38	67
July 24	18 - Montague Strait-Knight Island Passage	23	50	73
August 2	19 - Hinchinbrook Island-Ports			
9	Gravina and Fidalgo	50	42	92
August 3	20 - New England Fish CoEllamar		50	96
August 3	21 - Valdez-Port Fidalgo	22	20	42
August 1-4	22 - Granite Bay Point	23	20	43
Total		435	455	890
Percent		48.9	51.1	100.0

Table C-5. Chum salmon sex ratios for the Prince William Sound area commercial catch, 1952-53 and 1956-58 -- Continued

Date	Sample number and location	Male	Female	Both
957				
July 8	23 - Point Helen	53	46	99
July 9	24 - Point Helen	13	13	26
July 11	25 - Culross Island	5	4	9
July 13-14	26 - Porcupine Point	25	17	42
July 14	27 - Freemantle Point	45	25	70
July 21	28 - Bainbridge Point	12	8	20
July 22	29 - North Twin Bay	2	2	4
July 23	30 - Point Elrington	4	7	11
July 26	31 - Montague Strait-Knight Islan	nd		
·	Passage	50	40	90
July 28	32 - MacLeod Harbor	24	27	51
July 31	33 - Kiniklik Point	6	0	6
August 3	34 - Gravina Point	26	11	37
August 4	35 - Porcupine Point	61	54	115
August 8	36 - Point Elrington	13	17	30
August 10-11	37 - Bainbridge Point	15	29	44
August 12	38 - MacLeod Harbor	2	0	2
August 13	39 - Zaikof Bay	1	0	1
Total		357	300	657
Percent		54.3	45.7	100
958				
July 6	40 - Culross Island	15	11	26
July 7	41 - Point Helen	10	15	25
July 8	42 - Point Helen	13	21	34
July 9	43 - Point Freemantle	11	15	26
July 12	44 - Johnstone Point	38	42	80
July 14	45 - Point Helen	23	27	50
July 15	46 - Point Elrington	3	12	15
July 16	47 - Point Elrington	1	0	1
July 20	48 - Point Freemantle	107	83	190
July 23	49 - Johnstone Point	37	33	70
July 29	50 - Kiniklik Point	13	14	27
July 30	51 - Point Freemantle	34	29	63
August 3	52 - Johnstone Point	20	10	30
August 6	53 - Point Helen	9	5	14
August 7-8	54 - Point Elrington	<u>í</u>	2	3
Total		334	320	654
Percent		51.1	48.9	100

Table C-6. Chum salmon sex ratios for the Prince William Sound spawning grounds, 1952-57

Date	Sample number and location $1/$	Male	Female	Both
1952			- /	
August 15	1 - Sheep Bay (11)	10	36	46
August 20	2 - Duck River (44)	39	50	89
September 4	3 - Constantine Harbour (176)	50	13	63
September 11	4 - Sheep Bay (11)	25	19	44
Total		124	118	242
Percent		51.2	48.8	100.0
1953				
July 23	5 - Sheep Bay (11)	46	52	98
July 24	6 - Beartrap Bay (20)	27	38	65
July 25	7 - Olsen Bay (23)	30	34	64
July 27	8 - Indian Creek (45)	18	23	41
August 1	9 - Coghill River (83)	13	15	28
August 4	10 - Jackpot Bay (120)	40	9	49
August 10	11 - Olsen Bay (23)	24	27	51
August 12	12 - Constantine Harbour (176)	19	10	29
August 17	13 - Duck River (44)	80	44	124
August 17	14 – Indian Creek (45)	0	0	0
August 18	15 - East Long Bay (58)	4	1	5
August 18	16 - Cedar Bay (63)	2	1	3
August 19	17 - Wells Bay (65)	3	3	6
August 21	18 - Pigot Bay (89)	1	8	9
August 21	19 - Long Bay (100)	49	46	95
August 22	20 - Mink Harbour (102)	1	4	5
August 24	21 - Jackpot Bay (120)	67	57	124
August 27	22 - South Port Chalmers (150)	4	2	6
August 28	23 - Constantine Harbour (176)	44	42	86
August 31	24 - Sheep Bay (11)	13	19	32
August 31	25 - Sheep Bay (12)	48	30	78
September 2	26 - Olsen Bay (23)	37	24	61
September 2	27 - Beartrap Bay (20)	54	50	104
September 3	28 - St. Mathews Bay (26)	5	2	7
September 3	29 - Port Fidalgo (32)	0	0	0
September 6	30 - Long Bay (58)	38	16	54
September 7	31 - Eaglek Creek (73)	16	8	24
Total		683	565	1,248
Percent		54.7	45.3	100.0

^{1/} Number in parenthesis is number assigned by Fish and Wildlife Service to identify streams.

Table C-6. Chum salmon sex ratios for the Prince William Sound spawning grounds, 1952-57 -- Continued

Date	Sample number and location $\frac{1}{2}$	Male	Female	Both
1954				
August 16	32 - Sheep Bay (11)	19	16	35
August 22	33 - Cedar Bay (63)	9	5	14
August 24	34 - Eaglek Creek (73)	87	29	116
Total		115	50	165
Percent		69.7	30.3	100.0
1955				
August 21	35 - Crab Bay (141)	9	8	17
September 4	36 - Duck River (44)	33	41	74
Total		42	49	91
Percent		46.1	53.9	100.0
1956				
August 16	37 - McClure Bay (110)	16	14	30
August 18	38 - Coghill River (83)	48	58	106
August 19	39 - Eaglek Creek (73)	40	61	101
August 21	40 - Cedar Bay (63)	50	32	82
August 22	41 - Long Bay (58)	34	45	79
August 24	42 - Duck River (44)	38	55	93
August 30	43 - Sheep Bay (12)	57	73	130
August 31	44 - Beartrap Bay (20)	20	20	40
August 31	45 - Olsen Bay (23)	35	19	54
September 9	46 - Long Bay (100)	31	58	89
Total		369	435	804
Percent		45.9	54.1	100.0
1957				
August 15	47 - Jackpot Bay (120)	59	60	119
August 17	48 - North Pigot Bay (89N)	70	62	132
August 23	49 - Duck River (44)	20	22	42
August 25	50 - Sheep Bay (11)	20	20	40
Total		169	164	333
Percent		50.7	49.3	100.0

MS #1218



Created in 1849, the Department of the Interior--America's Department of Natural Resources--is concerned with the management, conservation, and development of the Nation's water, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States--now and in the future.

